

## INTERSCAPULO-THORACIC AMPUTATION FOR OSTEOMYELITIS OF THE HUMERUS.<sup>1</sup>

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E. A. G., aged thirty-nine, was admitted to the Methodist Episcopal Hospital under my care with the following history: Four years ago he fell from his wheel, striking upon the point of the left shoulder. Shortly after this he noticed an occasional sharp pain in the shoulder region on motion. He sought advice of a so-called "osteopathic doctor," who subjected the shoulder-joint to forced manipulations, under which the trouble became decidedly worse, when the treatment was abandoned. Antirheumatic treatment was then instituted without result; and, finally, one and one-half years following the first appearance of the symptoms, he sought advice in one of the metropolitan hospitals. Here the parts were immobilized by means of plaster-of-Paris for five weeks, without relief to the symptoms. One week after the removal of the plaster-of-Paris dressing an abscess formed in front of the joint; this opened spontaneously. Other abscesses followed, which were opened and the parts curetted. Healing followed. The parts remained healed for six months, when another abscess pointed in the cicatrix. This was incised; but others soon followed, due to pocketing of pus, which, in time, were opened up and curetted, but with comparatively little relief.

Upon admission the patient complained of pain upon motion, and consequent loss of function of the shoulder-joint. Atrophy of the deltoid was marked. Examination revealed a sinus discharging on the outer aspect of the arm, three inches below the

<sup>1</sup> Read before the New York Surgical Society, January 10, 1900.

level of the articulation of the shoulder, and in the line of an old cicatrix. This communicated with three separate pockets,—the first anteriorly and on the same level with the sinus; the second anteriorly and below; and the third posteriorly on the dorsum of the scapula. The movements of the shoulder were limited in all directions.

On May 30 a three-inch incision was made upon the outer aspect of the arm just below the shoulder-joint, opening up the cavity into which the sinus led directly; from this the other two cavities or pockets were traced, and each, together with the communicating sinuses, freely incised. All determinable infected tissues were removed by means of the sharp spoon. No rough or denuded bone was discovered at this time.

On the third day, a profuse purulent discharge having occurred in the meanwhile, another careful exploration was made, with the result that a small point of rough, bare bone was discovered near the upper angle of the wound, apparently in the neighborhood of the neck of the humerus.

On June 8, nine days after the preceding operation, the cavity of the shoulder-joint was opened by extending the vertical incision previously made in an upward direction. The head of the humerus was found to be the seat of extensive disease, almost half of its structure having disappeared, while the remainder was soft and broken down. The bone was freed from its attachments and section made at the surgical neck with the Gigli-Haertel wire saw. The contents of the medullary cavity were evidently diseased; but, inasmuch as consent to amputation had not been obtained, the expedient of curetting the entire length of the medullary canal was resorted to, an opening having been made at its lower extremity for facilitating the curettage and providing for efficient drainage. A 10 per cent. emulsion of iodoform in glycerin was forced through from the upper to the lower opening after curetting and "scouring" the walls of the cavity by means of iodoform gauze. Through and through drainage was then established by means of gauze strips.

Marked improvement followed this procedure. The iodoform gauze drain was changed daily and the medullary canal irrigated. The applications of iodoform emulsion were repeated several times. In the course of a fortnight the discharge from the medullary canal had apparently ceased, when the gauze drain

was permanently withdrawn. The patient left the hospital at the end of five weeks, and continued to gain rapidly in strength and flesh, although, in spite of curettage and antibacterial local treatment, the sinuses in the soft parts remained unhealed, discharging but slightly.

Three months later he again entered the hospital. The history in the interval included a thrice-weekly curettage and dressing of the infected sinus and the incision and evacuation of several abscess cavities in the soft parts about the shoulder and scapular region. A peculiarity of these latter was the suddenness with which they made their appearance; a puffiness of the parts would occur, followed in a few hours by rapid breaking down with marked constitutional disturbance. An examination at this time showed a renewal of the disease, with a separation of the upper third of the bone (pathological fracture).

On August 29 amputation at the shoulder-joint was performed. The glenoid cavity appeared healthy, and no further osseous disease could be made out. It was impossible, however, to obtain the requisite flap material without utilizing to some extent the soft parts which, from time to time, had been the seat of infection; although all existing sinuses were carefully dissected out, and the openings thus made in the flaps utilized for drainage.

The recovery from this operation was prompt; the flaps united without appreciable disturbance; and so rapidly did he regain his strength that he insisted upon leaving the hospital on the twelfth day. At this time the drainage openings were reduced to small sinuses, which gave promise of speedy closure.

An examination of the humerus after removal showed the entire bone the seat of an osteomyelitis, this even invading both condyles. The elbow-joint, however, was not involved.

Ten weeks later, on November 7, the patient was admitted to my service at the Brooklyn Hospital with an extensive recurrence of infection in the flap covering of the glenoid cavity. The sinuses had been regularly dressed with iodoform and Peruvian balsam gauze, and occasionally curetted. There was still the same history of rapid improvement, followed by sudden and unexpected relapse due to the occurrence of foci of infection which presented the features of rapid growth and necrosis of tissue, with constitutional disturbance.

On October 7, the infected soft parts were embraced by an elliptical-shaped incision, with the major axis of the ellipse vertically placed; this included the entire amputation flaps of the previous operation. The glenoid cavity and outer end of the clavicle thus exposed were then cleared, the outer fifth of the last named removed, and the scapula sawn across at its surgical neck. With the exception of an erosion here and there of the cartilaginous covering of the glenoid cavity, the bone removed appeared to be healthy. This removal of bone fulfilled its object of permitting coaptation of the edges of the large wound made by the sweeping incisions which cleared away the infected area made up by the flaps of the shoulder-joint amputation.

Rapid improvement again ensued, and in two weeks the patient left the hospital. The operation wound closed completely, and there was reason to hope that at last the infection had been removed. This hope was short-lived, however, for, after ten weeks of quiescence, it reasserted itself with apparent renewed virulency. The soft parts, including the supra- and infra-clavicular regions, were suddenly and venomously attacked; the first intimation of this being a stiffness of the shoulder and neck muscles. This was followed by chills, headache, and rise of temperature. Within twenty-four hours the involved parts became the seat of a brawny and painful swelling, this being particularly marked beneath the clavicular attachments of the pectoralis major muscle.

He was readmitted to the Methodist Episcopal Hospital on December 5, 1899, and consecutive interscapulo-thoracic amputation completed by the removal of the remaining portions of the clavicle and scapula. The incisions employed were practically those of Paul Berger, save that, owing to the extensive and extreme septic conditions present, these were placed at a somewhat greater distance, both anteriorly and posteriorly, from the point of the shoulder than the lines laid down by that surgeon. The infection was found to have extended beneath the pectoralis major muscle, and a lemon-sized septic cavity containing pus and the *débris* of necrotic tissue found below the clavicle and in the direction of the sterno-clavicular articulation.

It was deemed impracticable, on account of the septic conditions in the neighborhood of the vessels, and perhaps unnecessary, owing to the previous amputation of the arm and ligation

of the axillary artery, to ligate the subclavian preliminarily. In order to reach all portions of the extensively infected area upon the chest wall in front, it became necessary to turn down an anterior flap consisting of skin, fat, fasciæ, and pectoralis major muscle. An indurated mass in the thickness of this flap was found ready to break down; this was dissected out. Other demonstrable but smaller foci of infection were similarly treated. An area surrounding an old sinus in the posterior flap was also cut away.

The entire raw surface of the flaps, as well as the infected area upon the chest wall, was then carefully swabbed with a 2½ per cent. solution of formalin in equal parts of alcohol and water. The site of the suppurating cavity was packed with gauze wrung out of the same solution, a few silkworm-gut sutures placed at the lower angle, and the remainder of the extensive wound cavity lightly dressed with sterile gauze wrung out of equal parts of alcohol and water.

There was considerable loss of blood attending the operation, particularly that portion involving the removal of the scapula, and this, together with the patient's unfavorable condition owing to repeated relapses of sepsis, made it necessary to perform intravenous infusion during the operation, sixty ounces of normal saline solution at a temperature of 120° F. being employed.

The patient reacted well from the operation. The formalin alcohol dressings were removed at the end of twenty-four hours and simple alcohol and water dressings substituted. These were covered by a layer of oil-silk, and a trap-door cut through this and the retaining bandages in order to occasionally reinforce the dressings with the same mixture. This treatment was continued for another twenty-four hours. At the end of this time it was found that a slight superficial sloughing of the raw surfaces had been occasioned by the formalin application. This rapidly separated under powdered naphthalin and Peruvian balsam dressings; and in a week from the day of operation a healthy granulating process was in progress when the wound edges were coaptated by broad strips of adhesive plaster. In the meanwhile it had become necessary to remove the few sutures placed at the inferior angle of the wound, marked infection having occurred along the track of the silkworm gut.

The patient gained rapidly in strength and was thoroughly

convalescent in a fortnight. Examination of the bones after removal revealed the usual conditions present in osteomyelitis. The sawn surface of the clavicle and scapula made at the previous operation had evidently become the starting-point of a reinfection of bone from the already present infection of the soft parts. This had followed the cancellated structure far into the bone. This was cultivated at room temperature, and gave a slow growing and liquefying organism. This was placed in the hands of Dr. Ezra Wilson, Director of the Bacteriological Department of the Hoagland Laboratory. Dr. Wilson put the culture through subcultures on different media and found it to be a facultative anaerobic, liquefying, slightly chromogenic staphylococcus, corresponding in its morphology and cultural characteristics to the staphylococcus pyogenes albus.

In reflecting upon the conditions present in this case, which necessitated the final resort to what is usually regarded as an extremely mutilating procedure, there can be no two opinions as to the justification for the latter. In fact, in the light of the experience gained, I can but regret that it was not resorted to earlier. It is my present belief that interscapulo-thoracic amputation could have advantageously substituted the amputation at the shoulder-joint. This is based upon the line of reasoning that has impelled surgeons more recently—notably Professor Keen, of Philadelphia, and Dr. Russell S. Fowler, of Brooklyn, New York—to advocate complete removal of the upper extremity in cases of malignant disease of the humerus wherever located, namely, the necessity for obtaining flaps from tissues as far removed from the site of the original disease as possible. The persistency and virulence of the infection, and its invasion of the parts necessary to form the flaps for a shoulder-joint amputation, would seem to constitute the positive indication for an interscapulo-thoracic amputation, even though this demanded the removal of the scapula and all, or a portion, of the clavicle, with these still remaining uninfected. The attempt to compromise between the latter and an atypical amputation above the shoulder-joint by sawing off portions of the clavicle and scapula in

order to permit of the removal of the soft parts beyond appreciably infected tissues, while this is commendable from the æsthetic stand-point, proved in this case to be far from a conservative measure, since it only invited infection of the highly susceptible cancellated structure of the bones themselves. Further, the inadequacy of the drainage in the shoulder-joint amputation, as compared to that obtained in complete removal of the upper extremity, should not be lost sight of.

The hopelessness of certain cases of morbus coxarius with extensive disease of the femur and infection of the soft parts when operative procedures short of amputation of the hip-joint are instituted, and the fact that a certain proportion of these fail of cure because of coincident or subsequent disease of the os innominatum, seems to still further emphasize the importance, in the case of the upper extremity, of effecting a radical removal of parts already infected, and those likely to be affected, through interscapulo-thoracic amputation.

The necessity for interscapulo-thoracic amputation for conditions involving extensive involvement of the soft parts alone in infectious processes is illustrated in the following case.

A man, fifty-five years old, a stableman by occupation, was admitted to the Methodist Episcopal Hospital on November 17, 1895, with a history of having, while intoxicated and alone, upset a stable-lantern and severely burned the left arm and region of the shoulder. The parts about the latter were deeply charred, the muscular structures being invaded. Operation was positively declined, although repeatedly offered; and it was not until three weeks after admission that consent was obtained. In the meanwhile the patient's condition had become most unpromising by reason of extensive local and general sepsis. Interscapulo-thoracic amputation was performed as a forlorn hope, after Berger's method (preliminary ligation of the subclavian artery), on December 7. The operation was quickly performed, the loss of blood inconsiderable, and the patient left the table in fairly good condition. Unfortunately, however, pneumonitis, the foundation of which had been laid by the pre-existing septic conditions, de-

veloped upon the side opposite to that of the operation, from which he died on the third day. The operation wound remained uninfected.<sup>1</sup>

There is no doubt in my mind that this patient would have had an excellent chance for recovery had the amputation been performed earlier in the case. The extremely septic conditions which he developed in the interval robbed the operation of its character of successful conservatism and placed it in the category of desperate resources.

The following cases of interscapulo-thoracic amputation for osteomyelitis and analogous conditions are recorded in the literature:

CASE I.—William Fergusson, of Edinburgh,<sup>2</sup> reports the case of a male, aged thirty-three, with "caries" of the humerus and scapula, in whom disarticulation of the humerus had been performed three years before. Complete and permanent recovery followed consecutive interscapulo-thoracic amputation.

CASE II.—Berenger Férénd, Lorient,<sup>3</sup> report the case of a male, aged twenty-four, with osteomyelitis, and caries of the scapula and humerus, in whom a consecutive interscapulo-thoracic amputation was followed by recovery.

CASE III.—Poncet, Paris.<sup>4</sup> Consecutive interscapulo-thoracic amputation in a female, aged twenty-six, in whom, two years previously, a resection of the head of the left humerus had been done for "caries," and one year thereafter an amputation at the shoulder-joint became necessary. The conditions persisted, and the scapula became invaded before the final removal of the entire upper extremity.

CASE IV.—S. C. G., male, aged thirty-one. Tuberculosis of shoulder. The history of this case prior to the interscapulo-thoracic amputation included repeated incision and curettage of existing sinuses and abscesses and iodoform treatment at intervals, excision of the shoulder-joint five months, and, finally, after

<sup>1</sup> This case was more fully reported in the *ANNALS OF SURGERY*, February, 1900, p. 211.

<sup>2</sup> *Medico-Chirurgical Transactions*, 1848, Vol. xxi, p. 309.

<sup>3</sup> *Bulletin de Thérapentique*, 1885, 55. Année, xi, pp. 490-552.

<sup>4</sup> *Revue de Chirurgie*, Paris, 1887, Vol. i, p. 996.



a further period of eight months, the removal of the entire upper extremity. The axillary artery was ligated preliminarily. The hemorrhage was severe and necessitated an intravenous saline infusion. The patient made an excellently good recovery from the operation, but a sinus still persisted eight months after the operation.<sup>1</sup>

CASE V.—Bishop, New York. Male, aged fifty-two. Tuberculosis of shoulder region. Numerous sinuses existed which had been thoroughly curetted upon two occasions. Finally, interscapulo-thoracic amputation was resorted to, from which operation recovery took place. A large granulating surface still existed when the case was reported.<sup>2</sup>

The mortality of interscapulo-thoracic amputation for disease, according to the latest study of recorded cases, is 11 per cent.,<sup>3</sup> while that of disarticulation of the shoulder under the same circumstances is but 1 per cent. lower. This slight difference may be profitably disregarded in cases in which any doubt exists as to the possibility of removing all infected tissues, since, in a case of consecutive amputation, the risks run by the patient amount to almost double the mortality of an interscapulo-thoracic amputation primarily performed.

Berger and Adelman have each described a prosthetic apparatus for use following interscapulo-thoracic amputation, which, it is claimed, is as useful as that for cases in which disarticulation of the shoulder has been performed. The slight actual use to be derived from any of these, however, leaves but little for the surgeon to base a choice upon from this standpoint, while purely æsthetic consideration can be met by the skill of the mechanician.

<sup>1</sup> The Physician and Surgeon, Detroit, 1897, Vol. xix, p. 264.

<sup>2</sup> The Halmemannian Monthly, Philadelphia, 1897, Vol. xxxii.

<sup>3</sup> Russell S. Fowler. Meeting of Brooklyn Surgical Society, June 2, 1899, ANNALS OF SURGERY, January, 1900.